Title: K3 surfaces of high rank and Kummer surfaces

Abstract: We will discuss algebraic K3 surfaces (over $\mathbb{C}$) whose Néron-Severi lattice has high rank. In particular, we focus on those K3 surfaces which have a Shioda-Inose structure, that is, X has an involution ι which fixes any regular $(2,0)$-form, and the quotient $X/\{1,\iota\}$ is birational to a Kummer surface Y, which is the desingularization of $A/\{1,-1\}$ for an abelian surface A. In particular, we can write down an explicit family $\mathcal{X}$ of elliptic K3 surfaces with specified reducible fibers such that the birational quotient Y is always the Kummer surface of a principally polarized abelian surface. In the case when $K = Km(J(C))$ for a curve C of genus two, we can give the equations for X and ι explicitly in terms of the Igusa-Clebsch invariants of C. This construction has some number-theoretic applications: for instance, we can write down a parametrization of certain Hilbert modular surfaces (which are moduli spaces for abelian surfaces with real multiplication by a real quadratic field).